REMARKS

Claims 1-47 are pending. As a preliminary matter, Applicants wish to thank the Examiner for the notice that Claims 11-47 are allowed and Claims 2-10 would be allowed if rewritten in independent form.

Support for newly added claims 48 and 49 may be found, among other places, in the specification on page 32 line 25, page 37 lines 21-27, page 38 lines 1-18, page 39 lines 13-27, page 40 lines 1-32, and page 49 lines 1-24.

Claim 1 stands rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,462,738 to Kato (Kato). A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference.[1] Additionally, the single reference must set forth each of the claim elements as arranged by the claims.[2]

Kato

Kato teaches generating a control mesh of polygonal approximations. (Kato, Abstract, line 1, ¶1, 49-51). According to the Office Action, the control point b_{111} as taught in Kato corresponds to the claimed central control point. (Office Action dated December 17, 2003, ¶2, last sentence). Kato teaches that point b_{111} is given by equation 914. (Kato, FIG. 9, ¶8, lines 1-5). However, the point b_{111} as given by equation 914 merely represents the distance the Bezier patch will project from the plane containing the end points of the patch based on tangent vectors, not control points. (Kato, ¶8, lines 1-5). Equation 914 as shown in FIG. 9 is given as $b_{111} = 1/3 (v_0 + v_1 + v_2) + 1/3 (t_{00} + t_{11} + t_{22}) - 1/3 (t_{10} + t_{21} + t_{02})$. Accordingly, the point labeled b_{111} as

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1 Glaverzel Societe Anonyme v. Northlake Marketing & Supply, Inc., 75 F.3d 1550, 1554 (Fed. Cir. 1999); Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1953 (Fed. Cir. 1987); *see* MPEP 2131.

2 Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989); *see* MPEP 2131.

shown in Kato at FIG. 9 is a function of vertices v_0, v_1, v_2, and tangent vectors t_{00}, t_{11}, t_{22}, t_{10}, t_{21}, and t_{02} rather than "control points corresponding to the three edges." (Kato, FIG. 9, equation 914). As shown in more detail in FIG. 10, the tangent vectors 1003, 1004 for each edge 901, 902, 903 of the received polygon are generated based on the surface normal vectors 1001, 1002. (Kato, ¶7, lines 51-54). A first tangent vector 1003 is generated responsive to equation 1005 and a second tangent vector 1004 is generated responsive to equation 1006, where t_0 is the first tangent vector 1003, and t_1 is the second tangent vector. (Kato, ¶7, lines 54-57). Therefore, equation 914 explicitly describes point b_{111} as a function of tangent vectors and not as a function of two control points corresponding to each edge. Consequently, point b_{111} is not a central control point "using the vertex parameters for each of the three vertices and the control points corresponding to the three edges" as defined and arranged in the claims.

Independent Claim 1

According to the advisory action "Kato explicitly teaches control points as shown in FIG. 9 and [the] formula for b_{111} shown at FIG. 9 as 'a mathematical simplification' of a function of the control points at the vertices." As previously explained above and in the previous response, Kato teaches that the point labeled b_{111} as shown in FIG. 9, and as referenced by reference number 914 is an explicit function of the vertices and six tangent vectors rather than "calculating a central control point using the vertex parameters of each of the three vertices and the control points corresponding to the three edges." Further, equation 914 merely teaches the calculation of control point b_{111} based on tangent vectors and makes no reference to any control points, let alone the control points in equations 906 through 913. As a result, the assertion in the Advisory Action that "Kato explicitly teaches control points as shown in Fig. 9" to somehow calculate the formula for b_{111} shown in Fig. 9 mischaracterizes Kato and the formula for b_{111} because Kato teaches that b_{111} is an explicit function of six tangent vectors rather than two

control points. Further, the assertion that the formula for b_{111} is somehow an "explicit" "mathematical simplification" of a function of the control points at the vertices is contradictory since the b_{111} formula is not an explicit function of the control points, but rather of the tangent vectors. Additionally, the Advisory Action provides no explanation of how the formula for b_{111} is a "mathematical simplification." In contrast Kato teaches b_{111} as a function of six tangent vectors rather than two control points and therefore requires six complex vector multiplications. To the extent that Applicant calculates a central control point "using the vertex parameters for each of the three vertices and the control points corresponding to the three edges," Applicants' claimed subject matter is wholly different from that described in Kato, where Kato describes the calculation of control point b_{111} in equation 914 as a function of six tangent vectors rather than any control points.

Rather than teaching that the control points are the six tangent vectors in equation 914, the Office Action states "as can be seen in Kato, FIG. 9, the two control points corresponding to each edge are based on the vertex parameters of the vertices that define the edge." (Office Action dated December 17, 2003, ¶6, last three sentences of page 7 ending on page 8). "For example, the edge 901 is defined by vertices v_0 and v_1." Id. "The two control points (b210 and b120 on that edge 901) are calculated based on the vertex parameters that define edge 901, i.e., vertices v_0 and v_1." Id. However, Kato does not use any control points including b210 and b120 in equation 914 for point b_{111}. Contrary to the assertion in the Advisory Action, Kato explicitly shows that the point b_{111} shown as equation 914 is not a function of "control points corresponding to the three edges", but rather a function of vertices and tangent vectors.

The Office Action on page 8 asserts that "with respect to the central control point (b_{111}), it can be seen that equation 914 includes the parameters for each of the three vertices (v_0, v_1 and

v_3), and the control points corresponding to the three edges (t_{00}, t_{11}, t_{22}, t_{10}, t_{21} and t_{02})." (Office Action dated December 17, 2003, ¶6, page 8, lines 3-6). However, the assertion in the Office Action is incorrect since equation 914 is not a function of control points corresponding to the three edges but rather a function of the tangent vectors (t_{00}, t_{11}, t_{22}, t_{10}, t_{21} and t_{02}) as previously stated and therefore the resulting calculations are completely different. Applicants would like to point out the distinction between an edge and a tangent vector and the resulting calculations. The Office Action incorrectly equates "the control points correspond to the three edges" with tangent vectors t_{00}, t_{11}, t_{22}, t_{10}, t_{21}, and t_{02}; however, these tangent vectors are not control points as asserted in the Office Action. Applicants would like to point out the fundamental difference between a point and a vector and the resulting calculation. Additionally, Kato explicitly describes parameters t_{00}, t_{11}, t_{22}, t_{10}, t_{21}, and t_{02} as tangent vectors rather than control points and as such are completely different parameters than the control points resulting in completely different calculations. Accordingly, equation 914 cited in FIG. 9 of Kato which recites the calculation of control point b_{111} as a function of vertices and tangent vectors is limited to the calculation of point b_{111} as a function of tangent vectors rather than teaching "calculating a central control point using the vertex parameters for each of the three vertices and the control points corresponding to the three edges." As such, Applicants submit that Kato neither discloses, teaches or suggests Applicants' claimed subject matter. Accordingly, applicants request a showing.

As previously stated above, in contrast to the method of calculating a central control point using the control points corresponding to the three edges, Kato describes the method of calculation of point b_{111} based on tangent vectors requiring vector multiplication and as a result, is more computationally expensive and therefore not "a mathematical simplification." As a result of Kato's requirement for at least six vector calculations, the equation in Kato requires a

corresponding large amount of memory to store the intermediate results for the calculation of the tangent vectors as shown in FIG. 10. Kato, therefore, is referring to a completely different parameter and resulting calculation when referring to the tangent vectors rather than "calculating a central control point using the vertex parameters for each of the three vertices and the control points corresponding to the three edges." As such, where Claim 1 requires that the central control point is calculated based on the control points corresponding to the three edges, Kato appears to make no reference to the calculation of point b_{111} is not explicitly a function of any control points relating to the three edges. Accordingly, the cited portions of Kato explicitly teach the calculation of control point b_{111} based on vertices and tangent vectors. As a result, Kato is referring to a completely different method of calculating b_{111} with respect to the claimed elements, namely *inter alia* "calculating a central control point using the vertex parameters for each of the three vertices and the control points corresponding to the three edges."

Applicants submit that the calculation of point b_{111} as shown as equation 914 of FIG. 9 lacks the advantages present in Applicants' claimed subject matter. As previously stated, Applicants' calculation of a central control point is a relatively simple mathematical function of vertex parameters for each of the three vertices and the control points corresponding to the three edges. Unlike Applicants' subject matter, Kato requires a computationally intensive calculation of the six tangent vectors as taught by Kato in FIGs. 9 and 10 for tangent vectors 1005 and 1006. Tangent vectors 1005 and 1006 must be calculated based on the vector calculation of normal vectors and an edge. Since vector calculations and cross product calculations are required by Kato, the method described in the Applicants' claimed invention is wholly different than Kato's method as cited since claim 1 does not require vector calculations or cross products of vectors and as a result, is much more computationally efficient than the method taught by Kato.

The resulting computation as shown in equation 914 and the calculation of tangent vectors 1005 and 1006 as shown in FIG. 10 results in a number of other disadvantages. For example, according to the equations shown in FIG. 9, Kato requires the calculation of control point b_{111} as shown in equation 914 based on tangent vectors and as a result requires storage of the results of each computation for the tangent vectors as shown in equations 906 through 914. Consequently, the central control point computations performed by the method as shown in Claim 1 allow for a significant reduction in computational expense and a significant reduction in memory usage over the method taught by Kato in the computation of point b_{111} as shown in equation 914.

Since Kato teaches a different method than as shown in Claim 1 and is more computationally expensive and also more expensive in terms of memory storage requirements, the method taught by Kato is unsatisfactory to anticipate Claim 1 and further teaches away from Claim 1. Applicants submit that the computation requirements of equations 906 through 914 as shown in Kato in FIG. 9 lack these and other advantages present in Applicants' claimed method. Consequently, as the Office Action has ignored a principle limitation of Claim 1 and since Kato does not disclose "calculating a central control point using the vertex parameters for each of the three vertices and the control points corresponding to the three edges" as defined in Claim 1, Applicants submit that the Office Action fails to show how Kato anticipates the invention as defined Claim 1. Accordingly, reconsideration of the rejection and a showing of all the elements as arranged in Claim 1 is respectfully requested.

Further, Kato teaches "the surface normal information previously stored as part of the reconstruction data is retrieved 708 and used to generate two surface tangents for each surface normal." (Kato, ¶7, lines 48-51). (Emphasis added). Accordingly, since Kato teaches the

generation of surface tangents because a surface normal information was previously stored as part of the reconstruction data, Kato further teaches away from the claims because the calculation of any control points on the edges would result in the computation of extraneous results. For example, Kato teaches calculating control point b_{111} based on the tangent vectors without having to calculate the control points in equations 906 through 913 as an intermediate step. Accordingly, taken into proper context, Kato teaches the avoidance of the calculation of the control points because the calculation of the control points would result in extraneous and computationally expensive processing, and because of the necessary storage requirements for saving the results of each tangent vector computation as previously stated. For example, Kato describes the single iteration methodology to be implemented in dedicated hardware such that the recursive processing of conventional systems is eliminated. (Kato, ¶7, lines 2-5). As such, the cited portions of Kato teach away from the claims. Further, taking the teachings of Kato into proper context show that Kato is limited to a method for calculating point b_{111} using equation 914 based on vertex parameters and normal vectors, and therefore any modification to equation 914 would change the principle of operation to Kato.[3] Accordingly, not only does Kato teach away from the calculation of a central control point based on the control points corresponding to the three edges, any modification to Kato to avoid the calculation of point b_{111} based on tangent vectors would change the principle of operation of Kato because modifying Kato otherwise would greatly increase the computations required and would result in the unnecessary and

[3] If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959). *See* M.P.E.P. 2143.01.

extraneous calculation of control points for which Kato specifically has sought to avoid.[4] For example, Kato has calculated all the Bezier control points as a function of vertex parameters and tangent vectors. If Kato fails to suggest the computation of point b_{111} based on control points corresponding to the three edges, it is because Kato never contemplates the calculation of b_{111} based on control points corresponding to the three edges in view of Kato's explicit teachings, namely, the computation of these Bezier control points based on vertices and tangent vectors.

Applicants respectfully submit that the claims are in condition for allowance, and an early Notice of Allowance is earnestly solicited. The Examiner is invited to telephone the below-listed attorney at 312-609-7970 if the Examiner believes that a telephone conference will expedite the prosecution of the application.

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[4] If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959). *See* M.P.E.P. 2143.01.